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Mobilizing disability experience to inform architectural education

Lessons learned from a field experiment

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***Abstract*— Through their bodily interaction with the designed environment, disabled people are able to appreciate qualities designers may not be attuned to. In architectural practice, however disability experience is hardly acknowledged as a valuable resource for design. Since attitudes developed in the educational settings are carried into people's professional careers, this paper examines the added value of mobilizing disability experience to inform architectural education. To this end it analyses the course work of 29 architecture students who attended a course on inclusive design and, in this context, analysed a building in interaction with disabled people. Findings suggest that this interaction contributed to raising students' awareness about the built environment's impact, human variability, and the limits of empathy. In addition, it fostered students' insight into accessibility issues beyond the legal standards, and enriched their understanding of space. This awareness and insight in turn triggered a change in students' attitude towards disabled people. Further research is needed to examine the sustainability of these effects after students have graduated and gained experience in architectural practice.**

Keywords—architectural education; building evaluation; disability experience; inclusive design; user/expert

I. INTRODUCTION

Through their bodily interaction with the designed environment, disabled[1] people are able to appreciate qualities designers may not be attuned to [2,3]. This holds, for example, for people living with a mobility or sensory impairment [4], but also for people with a diagnosis on the autism spectrum [5].

This observation lies at the basis of a field experiment on the KU Leuven premises that mobilizes disabled students and staff to inform the redesign of university buildings [6]. The experiment was set up in the context of an elective course on inclusive design offered in the MSc program in engineering: architecture. In this experiment, disabled students and staff – so-called user/experts[2] [7] – each are teamed up with two architecture students attending the elective course. Each team visits and analyses a university building for which works are planned in the near future. Each building is visited by multiple teams. The architecture students document the visit in the form of an analysis report that is descriptive, narrative, and illustrated with pictures and graphic material. The architecture students discuss their findings with architects and other built environment professionals of the university's technical services.

As has been reported elsewhere [6], the experiment is a learning experience for all parties involved: through the building visit with a user/expert, the students become more reflexive about design practice; the user/experts become more reflexive about their own spatial experience; and the architects especially appreciate the nuanced approach to accessibility, and the broadening of the notion of accessibility by involving very diverse impairments (e.g., blindness, low vision, mobility impairment, autism). Moreover, the insights gained by involving disabled people motivated and informed the technical services to design and implement major alterations in some of the buildings analysed.

In this paper we aim to study in more detail what lessons architecture students can learn from the building visits with user/experts in the field experiment, in other words, what exactly the added value is of mobilizing disability experience to inform architectural education. After presenting the background for and set-up of the field experiment, we address this question from two different angles: 1) we rely on the analysis reports produced by the participating architecture students in five consecutive academic years; and 2) we rely on the architecture students' reflections on the elective course, which forms the context of the field experiment. We conclude with the most important lessons learned and directions for future research.

[1] In line with the WHO [1], we distinguish in this paper between having an impairment (a problem in a body function or structure) and being disabled (a complex phenomenon reflecting an interplay between features of a person's body and features of the environment and society in which that person lives).

[2] According to Elaine Ostroff [7], *"a user/expert can be anyone who has developed natural experience in dealing with the challenges of our built environment*", including people with an impairment who gain experience in dealing with disabling situations. For example, a blind person who has to navigate an environment designed with vision in mind, develops a natural experience in relying on auditory cues.

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II. BACKGROUND

A. Disability experience in architectural practice

Disabled people are increasingly acknowledged as lead or critical users in product and service design [8]: they experience a need that is not yet felt by the rest of the market, they expect high benefits from obtaining a solution [9], and they may interpret and use existing products in radically new ways [2].

In architectural practice, by contrast, disability experience is hardly acknowledged as a valuable resource for design: building accessibility tends to be considered as a matter of fact [10], as something people are detached from, taken care of by professionals and state officials, instead of something people are exposed or attached to. In Flanders (Belgium), building legislation strengthens this tendency by translating accessibility into facts: it fixes minimum door widths and maximum heights of thresholds [11], which can be objectively measured by professional accessibility advisors. Considering accessibility as a matter of fact limits the scope in which disability experience can be considered a valuable resource for design in two ways.

- On the one hand, it offers architects little insight into why a building feature may be problematic or appreciated. More than ten years ago, Gray et al. [12] already observed that accessibility legislation is felt by designers as restricting their creativity and removing the challenge to come up with intelligent design solutions. More recently, a survey among Flemish architects unmasked accessibility as one of the most irritating aspects of their profession [13].
- On the other hand, considering accessibility as a matter of fact leaves numerous buildings poorly accessible. A survey in the city centre of Leuven (Belgium) unmasked 70% of the 1500 commercial buildings as inaccessible for wheelchair users [14], even when applying less stringent accessibility criteria than legally required. Moreover, historic buildings in Flanders that are provisionally or definitely protected, or building sites located in (provisional or definite) conservation areas, are even exempt from this legislation.

Together these observations suggest a need to change architectural practice, by addressing building accessibility in a different way than based on objectively measurable facts.

B. Disability experience in architectural education

If architects are to address building accessibility in a different way, attention for disability experience should start during their education already. Indeed, attitudes developed in the educational settings have been shown to be carried into individuals' professional careers [15]. Moreover, students learn as much through the social culture and type of teaching and learning in the school, as they do by the content of the course [16].

In the late 1980s, disability experience was acknowledged as a valuable resource for architectural education by Raymond Lifchez [17]. At the University of California, Berkeley, he developed a curricular experiment by inviting physically disabled consultants to participate in the education of fledgling architecture students. Only by devising curricula that encourage students to view buildings through the eyes of their clients, he argued, will the next generation of designers gain the necessary understanding of human variability and complexity.

More recent initiatives in architectural education include, for example, the use of post-occupancy evaluation (POE) of buildings designed by famous Belgian architects in the architecture program of the former Sint-Lucas institute in Ghent [18]. Architecture students are introduced to the notion of 'user-orientation in architecture' in a workshop with user/experts with or without impairments (up to ten per 60 students). After having worked closely with a vision impaired person, a wheelchair user or someone with another physical or mental impairment, students evaluate a building by either simulating some of the impairments or collaborating with a volunteer user/expert. In this way, students are confronted with the impact of design-, technology- and/or human-centred approaches to architecture. Moreover, they learn to be more critical in their appraisal of architecture based on experience rather than what is published in professional magazines.

Similarly, Zuzana Ceresnova [19] engaged architecture students at the Slovak University of Technology in Bratislava in assessing the universal access of university buildings from the position of disabled people, through on-site observations and role-play/simulation activities. Students were allowed to choose the type of impairment for the simulation exercises. Most of them preferred to move in a wheelchair. The small number of students who chose to simulate blindness with special darkened glasses, received an introductory training on spatial orientation with a cane. Findings suggest that experiencing from the position of disabled people how they perceive space and how they are able to use it, can help students to think about architecture more sophistically.

In the remainder of this paper, we aim to gain a more articulate understanding of this necessary understanding, critical appraisal and more sophisticated thinking, and of how mobilizing disability experience can contribute to it.

III. METHODS AND MATERIAL

In order to pinpoint the added value that disability experience could bring to architectural education, we conducted a document analysis [20] of two sets of documents: the analysis reports produced by pairs of architecture students who participated in the field experiment, and papers in which these same students reflect individually on the elective course that forms the context for the field experiment.

A. Analysis reports

At the time we conducted the study, eight KU Leuven buildings had been analysed by several user/experts in collaboration with architecture students. User/experts had been recruited through the Service for Students with Disabilities and the network of our research group. Their impairments range from sensory impairments over mobility impairments to developmental conditions (see Table I).

TABLE I. IMPAIRMENTS OF THE USER/EXPERTS WHO PARTICIPATED

Vision impairment	- Low vision: blurred sight, tunnel vision, central black spot - Blindness: non-congenital
Mobility impairment	- Use of support (cane, trolley) - Use of manual wheelchair - Use of electrical wheelchair
Developmental condition	- Autism spectrum disorder

Each user/expert visited the building at stake accompanied by two architecture students (or an architecture student and a researcher). Unlike in some of the initiatives mentioned above [18,19] no simulation was used during the building visits. Although we did work with blindfolding in the past [21], we decided not to include simulation exercises in this course because they have been found to fail in simulating impairment correctly, as they address neither the coping strategies nor the skills disabled people develop in living with an impairment [22]. It can be even considered an offence against blind people(‘s skills) to compare blindfolded experience with actual, real-world blind experience.

After the building visit, the architecture students wrote a report that analyses and documents the disabled person's experience during the visit, illustrated with photos and graphical material (see Figure 1). It is these reports which formed the basis for our analysis.

Fig. 1. Graphical illustration of how a blind user/expert searches his way in the courtyard of a university building, and gets lost in between the bikes parked there (© J. Claeys & K. Happaerts)

To start with, 29 reports on five buildings were analysed qualitatively in terms of the following questions:

- how was the building visit approached?
- which kind of disability did the user/expert experience?
- what information was exchanged during the visit, and how was this information presented in the report?

Subsequently, the selected fragments were submitted to a thematic analysis.

The reports we submitted to a document analysis contain some degree of variation for several reasons. The user/experts and students were not given any fixed methodology for conducting and reporting about the building visits. Moreover, some of the user/experts participated in this particular exercise over a number of years, or were involved in other building assessments before, while for others it was the first involvement in such an endeavour.

B. *Students' reflections*

The second set of documents we analysed are papers in which students who participated in the building visits reflect individually on the inclusive design course. In these papers, students were asked to reflect on two questions:

- what do you consider the most important lesson(s) learned from the inclusive design course and why?
- and what do you consider the weakest point in inclusive design and how could this be addressed?

First, the students' papers were analysed to identify references (if any) to the interaction with user/experts. Subsequently, the selected fragments were submitted to a thematic analysis. Fragments cited below that were originally written in Dutch, have been translated by the authors.

IV. FINDINGS AND DISCUSSION

What exactly is the added value of mobilizing disability experience to inform architectural education? In writing about the most important lesson(s) learned from the inclusive design course, almost all architecture students referred to the interaction with user/experts. Judging from both the papers and the analysis reports, this interaction contributed to raising students' awareness, fostering their insight/understanding, and even altering their attitude.

A. *Raising awareness*

The interaction with user/experts made the architecture students more aware of the **impact of the built environment on people's life**. By visiting a building with a user/expert, students realized what problems people are confronted with – "*making a building accessible does not equal foreseeing a ramp next to a staircase*", but also how these practical problems carry a lot of mental weight for them. The latter made them aware that a poor design can cause mental stress, e.g., "*always being dependent on other people to move in and around the [building] is mentally not always easy for [the user/expert]*."

Moreover, the building visits raised students' awareness about the **diversity** in how people negotiate and experience the built environment. An architecture student who collaborated with a student with autism formulates it as follows: "*During the designs I made in the past years, I was aware that certain design decisions could lead to the exclusion of certain groups of people. This group I have always considered as a minority, namely only wheelchair users. By attending this course, however, I learned that it is not only the case for permanent, physical impairments, but also for mental and situational impairments*." This diversity became even more apparent during the discussion of the visits in class. A student testifies: "[during the building analysis] *it was already very informative to set off with a user/expert. Yet, what surprised me even more, is the discussion afterwards. All analyses with the different user/experts were presented. I was until then focused only on a person who had difficulty walking, but eventually the needs turned out to differ considerably per person and per impairment*." Even though this student had noticed already during the analysis how divergent the impact of the built environment is, during the discussion it struck her even more.

This diversity or divergence, the students learned, holds for people with different impairments, but also for people with similar impairments. A student writes: "*another remarkable issue that resulted from our [analysis] is that big differences do exist between the different wheelchair users. There are different models and systems [of wheelchairs], which makes it difficult to impose standard measures. Moreover, not every wheelchair user is able to, say, make the same arm movements. [User/expert A], for instance, was unable to push the buttons of the elevator because they were too high for her, while for [User/expert B] it was no problem*." Judging from the papers, the confrontation with this diversity made students think more about inclusive design instead of about adaptations that are specifically conceived for wheelchair users. At the same time, they discovered the difficulty of doing the right thing for everyone. However, this was not considered by the students as an excuse not to try it. As one student wrote: "*It is better to accept that the perfect solution is impossible, but that a considerable improvement is possible thanks to an inclusive vision.*" Or, as another student wrote, "*It is impossible to do the right thing for everyone, but it is even more impossible if one does not know what 'doing good' entails.*"

A third aspect students became aware of, is that there is **a limit to empathy**. A student formulates this as follows: "*I've noticed that you can never know how another person experiences the space. You can think that you know it, but go completely wrong. Often surprising elements come to the fore that you never had seen yourself. Visiting a place with a person with an impairment can offer you many insights.*" By consequence, students conclude, user/experts have a crucial role to play in the design process, namely to raise issues that designers have overlooked: "*empathising with their situation is not always possible, so that we depend on them for drawing the correct conclusions and not overlooking anything.*"

Rob Imrie [23] found that architects rely heavily on their own body to design a space. Interacting with user/experts showed the architecture students the limitations of such approach. From their own insights we see them reflect on the importance of variability of perspectives and experiences. Furthermore, they recognized the limitations of empathy to account for such variability. Starting from one's own body as reference cannot provide all the richness in information of observing the actual engagement of others with the built environment.

B. Fostering insight/understanding

Besides raising students' awareness, the interaction with user/experts also fostered their insight and understanding. On the one hand, several students testify and demonstrate that they acquired a better understanding of accessibility beyond the legal standards; on the other hand, several contend that the interaction with user/experts enriched their understanding of space.

1) Understanding accessibility beyond legislation

Judging from the analysis reports, the building visits in collaboration with user/experts provide architecture students a rich and nuanced overview of building qualities that surpass accessibility legislation and standards.

a) Accessibility standards versus situations of use

As mentioned, accessibility standards in Flanders translate accessibility into facts by focusing on measurable elements: they fix minimum door widths and maximum heights of thresholds [11], which can be objectively measured by professional experts based on a checklist. These measures are often determined based on the needs of one user group (c.q., wheelchair users) to provide them with the best space to use. This makes it difficult to know the effects on usability for other user groups, however. Furthermore, spatial qualities that are not dividable or measurable, but nonetheless crucial to certain people or user groups, are easily omitted from a quantified approach.

The architecture students report that through the building visit with a user/expert the accessibility regulation became more understandable to them, as the level of abstraction disappeared: "*There is a saying 'you have to experience yourself before you understand it' and that certainly applies here*." This was confirmed by the analysis reports. During the building visits in collaboration with user/experts, adaptations to accessibility standards already applied to the building were put to the test: were the adaptations sufficient to improve the use of the building? For instance, the road towards one of the buildings visited was paved with tactile tiles to guide persons with a vision impairment; a blind user/expert found them to be confusing as they did not line up enough with the actual entrance to the building. In case of another building, the entrance was expanded with a ramp for wheelchair access; a user/expert in a wheelchair found them difficult in use as the slope was still too steep. In her electric chair she could mount, albeit uncomfortably (experiencing a feeling of falling over), but she questioned whether someone in a manual wheelchair would be able to do so. Furthermore, the ramp led up to a door that was too heavy for her to open, rendering the new addition useless (see Figure 2).

In situations where a standard cannot be applied, e.g., due to lack of space, the user/experts suggested feasible solutions in

the situation.[3] For example, in the abovementioned example, the wheelchair user suggested to reposition the ramp and implement a less heavy door. Another option she mentioned was to install an intercom to ask help from the nearby secretariat. To enter she eventually asked the help from a passer-by.

Fig. 2. The addition of an entrance ramp that does not meet the standards and leads to a door that is too heavy to open (© H. Wauters & L. Vander Elst)

Moreover, adaptations made for one user group were tested by multiple user/experts with different impairments. This reveals contrasts between different needs, we mentioned, but also neutralities and synergies, surpassing the checks based on information derived from one user group (e.g., wheelchair users). Accessibility standards applied for one user group are not always helpful for all, and can even become an obstacle for some. The visits with people from multiple user groups enabled the architecture students to identify these gaps in the accessibility standards. To give one example: a floor surface devoid of any differences in height provides a comfortable space for wheelchair users (and would pass a check based on the accessibility standards) but offers no information to a blind person relying on a cane to navigate that space.

The building visits in collaboration with user/experts also drew the architecture students' attention to building qualities that are already present without any specific accessibility adaptations, but that provide an environment that supports their needs adequately. A case in point are the handrails of staircases, which can be hazardous for people with a vision impairment at times. In historic buildings, however, the handrails of original staircases often start early enough and continue over multiple flights so that a person can detect the stairs in time and comfortably follow the rhythm and discontinuities through the continuous handrail.

More broadly, the building visits in collaboration with user/experts offered the architecture students insights into the actual use situations that are linked to accessibility standards. They provided a translation of the numerical values that are at the core of these standards to the impact on the user/experts' actions. As such, the user/experts explained the why and how of their needs. Throughout the visits by a user/expert with a mobility impairment, for instance, one important element were the handrails. Although subject to standards of presence and dimensions, some situations turned out to require a handrail, others did not (e.g., a wall could provide sufficient support to descend a ramp). Furthermore, the user/expert could demonstrate and explain how he used the handrail differently in different situations: sometimes for support (to avoid falling), sometimes for grip (to pull himself forward). Information like this is important for (future) architects who need to apply standards in an integrated way into the complexity of a design.

The collaboration with user/experts also allowed students to visit one place many times over, meaning that during the visits, some places or situations could be altered slightly on the spot to analyse multiple (hypothetical) situations of use. For instance a door that was opened most of the time was closed and tested. Places were tested independently or with help.[4] Including these multiple situations of use made the analysis more robust than a mere walkthrough based on a checklist.

b) Gradient in obstacles

An important addition to the knowledge incorporated in accessibility standards are the nuances of how the application or not of such standards is experienced and dealt with. The situations in which obstacles are encountered were identified in many more different ways than the presence/absence evaluation of a checklist approach. In the reports made by the architecture students, the obstacles were identified as:

- impossible to overcome;
- requiring assistance;
- requiring personal tactics;
- not requiring assistance from other persons;
- comfortable to take.

This gradient was revealed when the user/experts tackled an obstacle in different ways, which was made possible by the presence of the architecture students. If one obstacle turned out impossible to be overcome independently, the user/expert first tried another method. If this failed too, the architecture student could help to continue the visit. For instance, in a situation where a user/expert with a mobility impairment encountered a flight of stairs, he could not continue with his wheelchair. Secondly, the absence of a handrail meant that he could not use that as support either. A third strategy where he uses a trolley for support (something that helps him overcome smaller height differences) failed too in this particular case of stairs. The strategy that worked was to ask and to rely on the architecture students to support him going down (see Figure 3).

The possibility to identify obstacles of different degrees allowed the architecture students to make a building analysis that takes into account more factors than the (abstracted) impaired person and the building only, such as the help of others, or the person's own creativity. The gradient also surpassed minimal requirements of usability when the user/experts talked about comfort in situations they identify as potential obstacles. Extending the architecture students' focus towards comfort is a potentially important one. Being

[3] See also User group strategies and personal tactics.

[4] See also Gradients in obstacles.

comfortable frees up more resources of the building visitors to spend on other activities such as conversing with others.

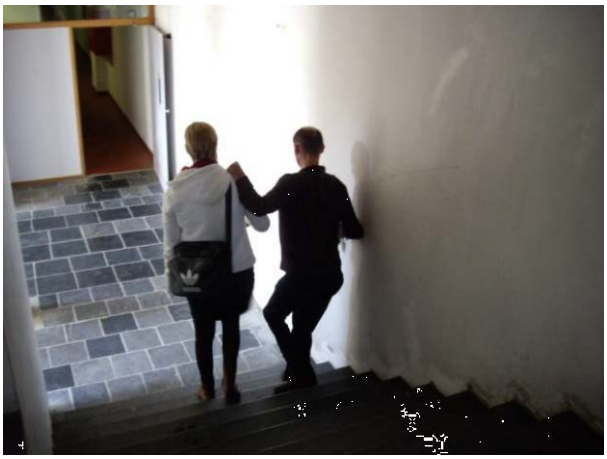

Fig. 3. User/expert with mobility impairment relying on architecture student to take a flight of stairs (© H. Deraeve & K. Janssens)

c) User group strategies and personal tactics

During the visits, the user/experts made a distinction between user group strategies and personal tactics in dealing with the built environment and its obstacles.

User group strategies refer to what user/experts have learned from others with similar impairments through schooling. An example of a strategy taught to blind persons is shorelining: identifying and following as much as possible continuous lines in the environment to reach a destination. Personal tactics refer to in situ adaptations of strategies to the situation at hand.

When the user/experts encountered obstacles during the visit, they demonstrated how they dealt with them. In this way, the architecture students could observe their tactics. Furthermore, the user/experts described verbally how these tactics followed or diverged from their general strategies. In one situation, the user/expert instructed the student both about their personal experiences, and about generalities in the experience of other people with similar impairments. Important here is the tying together of tactics and strategies to demonstrate the limits of the latter. Strategies could be taught to (future) architects, but the nuances of the tactics emerge from actual use situations. One example that came to the fore in multiple analysis reports is how blind user/experts relying on shorelining have to adapt to the situation at points were tactile tiles are not present. Tactics demonstrated in such situations range from trying to find natural guidelines following the general direction, over trying to find people to ask to help them, to falling back on the support of the assisting students.

When the user/experts presented solutions to overcome obstacles, they did so in the situation. This means that apart from the how, they can explain the why, which enabled the architecture students to *understand* the solution. This understanding should allow them to integrate it more easily in the complexity of a larger design solution. By understanding the how and why, the architecture students know better the limits of how to alter the standard solution. Continuing with the example of shorelining, the blind user/experts' actions demonstrated to the architecture students where the environment provided natural guidelines, what elements made them and how the user/experts could find them. This is potentially interesting information as it allows the (future) architects to implement the environment needed for shorelining by using elements that are part of that environment (e.g., curb stones, gutters, floor joints, …) rather than an extra layer of tactile tiles.

2) Enriching students' understanding of space

Besides identifying obstacles in the visited buildings, the user/experts also described to a larger or lesser degree their general experiences of the building and its spaces. Because of their specific bodies, the user/experts have specific experiences that can differ from the ones of most (future) architects. The interaction with the user/experts therefore provided the architecture students a richer insight into the building's qualities, in particular sensory qualities. People using a wheelchair are more attuned to visual qualities from a different (lower) perspective, e.g., in views towards outside, or visibility of wayfinding systems. People with a vision impairment marked acoustic and haptic qualities. Those who have some remaining sight were able to pinpoint difficult lighting conditions. People with autism were strong in identifying the general atmosphere of spaces, providing insight into the legibility of a building, e.g., whether a public passage is also experienced as public. As two architecture students who worked with a student with autism formulate it in their analysis report: "*Before this visit, we would never have spent so much attention to mental thresholds.*"

Also in the papers about the inclusive design course, several architecture students described the interaction with a user/expert as an enriching experience that made them look at the built environment in a different way – something that came to the students as a surprise. A final year student expressed this surprise as follows: "*To be honest, I chose this course because it fit in my weekly schedule and I needed the [credits]. I am not writing my thesis about this topic or I have never been very interested in this topic, just because our education program does not offer lectures of this kind of view on architecture. [To] my own surprise, this course has ended up to be one of the most unforgettable and useful courses during my studies at KU Leuven. Guest lecturers, [opportunities] to get to know a real user/expert, touching experiences from professors and real life stories made [...] me look in a fully different way [at] architecture and a design process.*" Another student confirmed: "*it is fascinating to discover how spaces can be experienced also in a different way, and as architect-to-be this can lead to an added value in your buildings. Architecture is more than only a visual experience.*"

C. Changing attitude

The awareness and insights students gained also seemed to trigger a change in attitude towards people with an impairment of some form. Some students seemed to be aware of this change in attitude. One of them wrote in her paper: "*It is important to know why you do something so that you effectively want to do it of your own accord. It is this 'why' that I did learn somewhat from this course.*" Others criticize the attitude

they had before attending the course. Accessibility, they confess, was typically considered as a tricky problem, while elevators, slopes and handrails were viewed as disturbing elements in a "*pure architectural game*".

Another sign of this change in attitude is the critique the architecture students formulate on their curriculum: "*for everybody who attended [this course] it was the first time that accessibility became more than a wheelchair-accessible toilet*." Several students are surprised that during the previous three to four years of their architectural education they had not heard about inclusive design: "*That is astonishing, since after all we do design for people, and the persons who do not fit within the standard pattern for which we usually design, do belong to these too. Becoming aware of this problem is something that actually should be addressed much earlier in the program already.*"

Very telling in this respect is the architecture students' indignation about the attitude of classmates. One student, for example, describes her frustration during a group assignment in which she and her group members had to renovate an old brewery into a public building. At some point, the students struggled with the problem that they had positioned the entrance at a lower level than was originally the case, and did not see a solution to connect the entrance via a sloping platform with the existing environment.: "*I actually fell of my chair in surprise when my fellow group member blurted out: 'Can't we just ignore those wheelchair users? Because otherwise our design becomes ugly.'*" A sentence that is since then etched in her memory. It made her angry that her fellow group member did not have an eye for inclusivity at all. Part of her could somehow understand that people who have no experience at all with people with an impairment, will not immediately take them into account. But the realisation that even future designers lack this sensibility, was very disappointing to her.

Besides to the attitude of fellow students, the architecture students also criticise the attitude of their teachers. A vivid example of this criticism is the following: "*My biggest desperation occurred while drawing out my latest design, a light superstructure between [2 buildings]. I managed to convince my design partner of the importance of inclusive design. We chose a clear floor plan, with fixed measures, and opted for a small platform lift since our 2nd floor did not directly connect with the neighbouring buildings. Our design teachers [however] could somehow see the use of it, but [for them] it was no priority. And this vision becomes especially clear from the other designs by classmates*." A similar anecdote was referred to by a student who had attended the year before a design studio that focused on the design of a cancer care centre: "*One of the students had a very strong concept centred around a kind of treehouse. The only problem was that it turned out to be very difficult to integrate in this design an elevator in a beautiful way. The teachers were so convinced of the concept that they eventually said: 'Leave the elevator at that, your design is without the elevator very strong and it would be a shame to change something about that.'*" The student found this decision all the more regrettable because a cancer care centre is meant for people affected by health problems: "*in such case you cannot decide that people who have difficulty walking cannot enter your building, can you?*"

Although students' change in attitude might be a result of the course as a whole, their papers suggest that this change is triggered to a major extent by the interaction with user/experts. Particularly important in this respect seems to be that several user/experts are students themselves, and thus belong to the architecture students' peer group. As a student writes: "*The analysis of [the building] in collaboration with user/expert D. has made me face the facts. Because she has my age, it was a very confronting experience. She is the one who really made me realise that accessibility should be a basic norm for the design of public buildings.*"

A few architecture students write that this interaction was very enriching indeed, but not always easy. For some it was the first time they were confronted with a disabled person, which affected their way of communicating. During conversations with a vision impaired student, for instance, an architecture student was very much aware of the difficulties the user/expert encountered in finding her way in society: "*I tried not to confront her too much with her impairment by, unconsciously, using synonyms for the verb 'to see'. Afterwards I realised that this was not the right method. She regularly used the verb herself and precisely the fact that she can use it without difficulty suggests that she is well integrated in society*."

Other architecture students point at the difficulty of asking the user/experts the right questions, a problem also reported by Lifchez: "*some [students] were naturally shy, other unsure how to ask (or, more basically, what to ask)*" [17]. An architecture student who collaborated with an autistic student described this difficulty as follows: "*During the screening it struck us that it was very difficult to communicate with [the user/expert]. We were inexperienced in working with user/experts ourselves and [the user/expert] had never been faced with such an assignment either*." Eventually they found a way to gain access to the user/expert's experiences through a combination of observation, questions and follow-up emails: "*The big lesson I can learn from this,"* the student concludes, *"is that also working with user/experts requires some training, both from the designer as from the user/expert him/herself.*"

V. Conclusion and Future Research

What exactly is the added value of mobilizing disability experience to inform architectural education? In this paper we set out to address this question by analysing what lessons 29 architecture students learned from building visits with user/experts. This analysis suggests that the interaction a) contributed to raising students' awareness about the built environment's impact, human variability, and the limits of empathy; b) fostered students' insight into accessibility issues beyond the legal standards, and enriched their understanding of space; and c) triggered a change in students' attitude towards people with an impairment.

The students learned the limits of falling back on their own body as reference for design. Accounting for the variability in building users by relying on empathy has its limitations. Empathy still departs from the students' own bodies whereas observation and interaction with user/experts departs from the latter's body within the environment.

The students learned to add to the quantitative approach of accessibility legislation a qualitative approach to analyse building use (from a disability perspective). They contextually learned the how and why of use situations, crucial information to be able to integrate solutions into the whole of a design. Interestingly, this addition opened up issues beyond usability as it informed the students also about spatial qualities they were not aware of before.

At the level of attitude, the students took from the interaction with user/experts the societal importance of taking disability into account when designing. They made the move from accessibility as an abstracted legislative obligation to the impact of the built environment on people's life.

In this respect a limitation of the study presented here is that it focused on the perspective of the architecture students only. In future research, it would be interesting to add the perspective of the user/experts and investigate how they experienced the mobilization of disability experience in architectural education.

Another limitation is that so far only a limited number of impairments were covered in the field experiment, c.q., vision impairment, mobility impairment and autism. Future research should extend the scope of the study by including the user/expertise of people with other impairments.

A final limitation of the study is that the participating students were asked to reflect on what they had learned at the end of the semester in which they took the inclusive design course. It would be interesting to repeat this exercise, and to ask them to look back upon their interaction with user/experts, after they have graduated and have gained some years of experience in design practice.

Awaiting the results of this repetition, the results presented in this paper demonstrate the added value of incorporating this kind of interaction as part of the learning trajectory for architectural students to understand the prospect and limitations of inclusive design practice. Judging from the students' analysis reports and reflections, this confrontation with the consequences of design for individuals with various impairments is important to obtain a change in the mind-set of future architects.

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